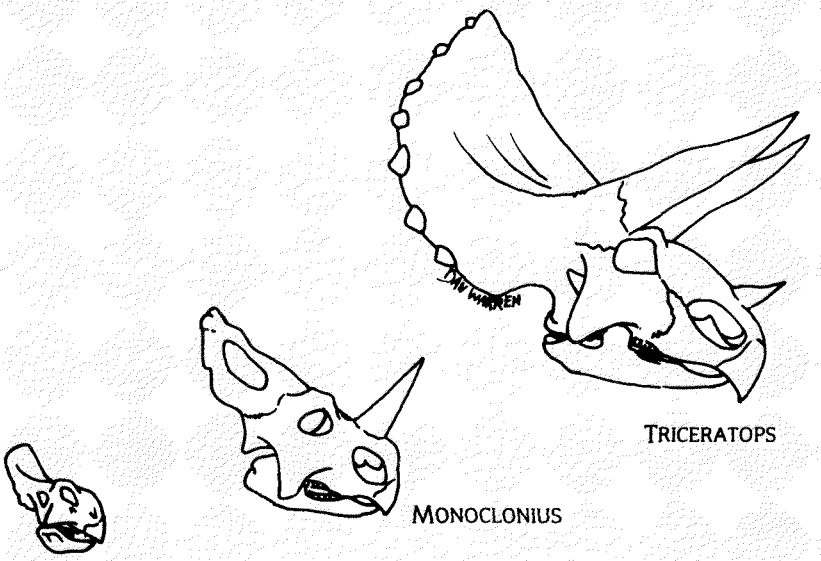
Creation / Evolution



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SYMPOSIA

History of Science Society Annual Meeting, Philadelphia, Pennsylvania, October 28–31, 1982. On October 31, there will be a session entitled "Creationism and Its Challenge," featuring Dorothy Nelkin, Michael Ruse, Malcolm Kottler, and Ronald Numbers. Lectures will cover the legal issues, the textbook controversy, the history of creationism, and scientific responses. For details, contact Stephen Brush, University of Maryland, Institute for Science and Technology, College Park, MD 20742, or phone (301) 454-2724.

"Evolution, Religion, and Society: Historical Perspectives on the Centenary of Darwin's Death" was the title of a two-week-long series of lectures and programs on the creation-evolution controversy which took place October 3–15, 1982, in the Chicago area. The most significant programs were:

- "Human Nature: From Creation to Evolution," sponsored by the Institute of Religion and Medicine, October 4, at the Illinois Athletic Club.
- "The Great Debate: Evolution and Society in the Nineteenth Century" and "Women's Place in Evolution," Department of Natural Science, Loyola University, October 5.
- "Since Darwin's Death: Religion, Society, and Evolutionary Thought" over WGN radio, October 5.
- "Bible/Science Forum," Science Lecture Hall of Wheaton College, October 6.
- "Creationism in American Culture and Theology," Lutheran School of Theology at Chicago, October 9. This day-long program, which was assisted by the Chicago Area Committee of Correspondence, featured theologians, historians of science, and three of the witnesses from the Arkansas trial.

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The Dilemma of the Horned Dinosaurs

Frederick Edwords
with illustrations by Daniel G. Warren

The fossil record is one of the most common subjects about which creationists argue. They claim that evolution cannot possibly be true because the fossil record is riddled with gaps, that various life forms appear abruptly and without a trace of ancestry, and that there are no transitional or intermediate forms between the various fossilized organisms.

It is indeed true that the fossil record contains gaps and that forms often appear abruptly. It is not true, however, than ancestral and intermediate forms do not exist. There are many familiar examples of fossil series, such as that of the camel, horse, deer, tapir, rhinoceros, elephant, and hominid sequences, that demonstrate relatively gradual changes over time. In fact, the fossil evidence for the evolution of the camel, beginning with its small, four-toed ancestor, is so extensive and step-by-step that no company or organization in America will go to the expense of publishing all the data in one place.

The sequence of titanotheres is among the lesser known mammal series. These fossilized animals, dug out from the White River deposits of Colorado and adjacent states, begin in the Lower Eocene with an animal a little larger than a pig. As we move up the geologic column, we see this form evolve progressively into a larger animal with progressively larger horns. The record shows that these horns move forward from near the eyes to a position projecting out over the snout. The last of the line, in the lower Oligocene, has a head a meter long with horns of over thirty centimeters. This series represents over twenty million years of evolutionary change.

Besides mammals, there are marine organisms with long fossil histories, such as the sea urchin, snail, and trilobite. Dr. Niles Eldredge of the American Museum of Natural History has devoted considerable study to these, in particular to the evolution of the trilobites. In his book, *The Monkey Business*, he goes

---

Fred Edwords, editor of Creation/Evolution, *has lectured and debated widely on the creation-evolution question. He is on the board of the New York Council for Evolution Education and is administrator of the American Humanist Association.*

Dan Warren is a student at Trent University, Petersborough, Ontario, and is in the process of completing his B.S. in biological anthropology. He is a former student of Eastern Pentecostal Bible College. As a biological illustrator, he has worked on a number of projects, including the ecology bulletin at Trent and several books.

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into some detail on the various evolutionary stages leading to a particular suborder of trilobites, the phacopids. He further points out, "Trilobites are as diverse and prolific as the mammals, and examples of evolutionary change linking up two fundamental subdivisions of the 'Class Trilobita' . . . are as compelling examples of evolution as any I know of" (p. 118).

All the above-mentioned sequences are quite complete, though their pattern is not a linear progression as most persons imagine it should be. The fossil evidence rather shows a radiating or "tree of life" pattern, often involving many offshoots, regressions, and uneven developments. This is what should be expected. Too even and progressive a development might imply design—and hence creation.

Creationists in debate understandably refrain from mentioning such series as these. They prefer to concentrate on animals further back in the fossil record for which the evidence is less complete and where "abrupt appearances" are more common. Dinosaurs and other Mesozoic reptiles are a preferred target. Duane Gish of the Institute for Creation Research is fond of running through a series of slides of these animals during his debates and claiming that each is a sudden appearance in the record and is unrelated to any other animal.

Dr. Gish includes one slide of a *Triceratops* dinosaur. When I first saw him present this, I was amazed that Dr. Gish could be unaware of the well-known ancestry of this animal. But, in debate after debate, he persisted in claiming that *Triceratops* had no ancestors, that no similar dinosaur existed with anything less than its full set of three horns. On page twenty-one of his book, *Dinosaurs, Those Terrible Lizards*, he committed himself in print.

> Nowhere do we find in-between forms with spikes starting out as little spikes which gradually got bigger and bigger and finally ending up as a *Triceratops* dinosaur. The first time you see a dinosaur with armor plate on its head and with three spikes, he is a full-fledged *Triceratops*, with a huge armor plate and with three big spikes. This is strong evidence for creation!

Every sentence of this is false. First, there definitely are in-between forms in the fossil record which have lesser and smaller "spikes" (horns); Dr. Gish denies that these exist. Second, *Triceratops* is not the only dinosaur with "armor plate [bony frill] on its head and with three spikes." He ignores *Pentaceratops* and *Torosaurus*, among others, which also fit this description.

To make the point clearer, however, it will be useful to review the evidence for the evolution of the ceratopsians—or horned dinosaurs—by covering each link of the evolutionary chain in some detail and by providing illustrations.

Psittacosaurus (sit-a-ko-SAWR-us), or "parrot lizard," begins our story. This animal lived some 118 million years ago in the Lower Cretaceous period. Its fossils are found in the Ondai Sair Formation of Mongolia and in the Lower

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Cretaceous rocks of Kansu and Shantung in China. It is classified as a ceratopsian because of the features it shares in common with the later members of the ceratopsian "family tree," namely the sharp downturned upper jaw which resembles the beak of a parrot and the beginnings of a bony frill at the back of the skull. *Psittacosaurus* could walk on its two hind legs or on all fours, but the two-legged posture seems to have been its most common method of locomotion. It was about a meter and a half long.

The only major *caveat* in the proper placement of this dinosaur is that all species so far found, such as *Psittacosaurus mongoliensis* (pictured at the top of Figure 1, page 4), could not have been the direct ancestors of the later ceratopsians. This is because the teeth in the front of the upper jaw found in the later *Protoceratops* are already absent in the extant fossils of *Psittacosaurus*. Nonetheless, it was an animal from this same genus that was the direct ancestor, and the species we do have indicate what the missing example must have been like. (As Niles Eldredge argues on page 125 of *The Monkey Business*, it isn't a major problem for evolution or for classification of species if one lacks *the* ancestor of a given form. Often later cousins will provide us with most of the information we need. Furthermore, because very few animals are ever fossilized, it should come as no surprise that pieces in the story are often missing.)

Leptoceratops (lept-o-SER-at-ops) allows us to discuss the next step. About 100 million years ago, the family called the Protoceratopsids appeared on the scene. This was in the Upper Cretaceous. *Leptoceratops* was a North American genus that was actually the last representative of this family. However, it has been determined to have been a slightly modified survivor of the ancestral group that later developed into *Protoceratops*.

At least six examples of *Leptoceratops* have been found in the Upper Edmonton Formation of the Red Deer River in Alberta, Canada. *Leptoceratops gracilis* is the species pictured in the center of Figure 1. The skeleton and skull show a very primitive structure, but demonstrate a later change in that two teeth are absent. The bony frill over the neck, which is a feature of the later ceratopsians, is only slightly developed. The feet and hands still show the claws common to *Psittacosaurus*, but *Leptoceratops* probably walked less often in the two-legged posture. In size it falls about midway between *Psittacosaurus* (top, Figure 1) and *Protoceratops* (bottom, Figure 1).

Protoceratops (Prot-o-SER-at-ops) was a direct descendant of the ancestral line that produced *Leptoceratops*. *Protoceratops* was about two meters long, was more heavily built than its predecessors, and had claws that showed a change toward the small hooves common to the later ceratopsians. Its frill was fully developed, and this increase in size was directly related to the larger neck and jaw muscles which were, themselves, related to the powerful shearing teeth that

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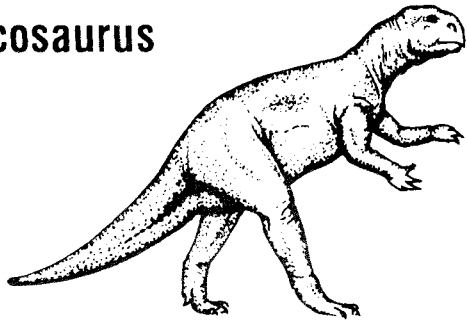
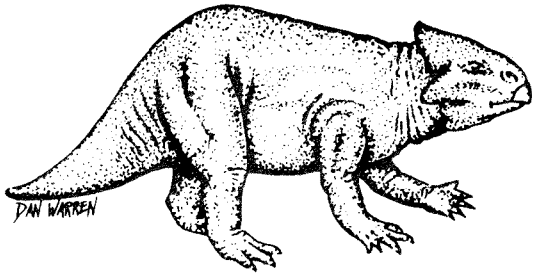
1. Psittacosaurus



1M

2. Leptoceratops



3. Protoceratops

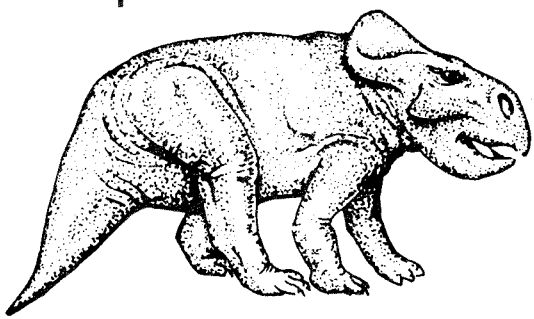


Figure 1

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allowed the animal to consume tougher plant material. As in the previous stages in the evolution of the ceratopsians, *Protoceratops* had hind legs longer than its forelegs. It was able to stand on the hind legs while digging in the ground with the forelegs. But, aside from that, *Protoceratops* walked fully on all fours.

Protoceratops andrewsi is the only species known, but there are a large number of specimens of differing growth stages covering everything from hatchling to adult. Over a hundred skeletons showing these stages were found in 1924. Nests of eggs were also discovered. All the finds have come from the Djadochta Formation of Shabarakh Usu in the Gobi Desert of Mongolia and from the Ulan Tsonch Formation in Kansu, China.

The presence of *Leptoceratops* in North America, as well as the presence of close cousins and identical genera of other types of dinosaurs on both continents, indicates that passage was relatively easy between the continents at the time these dinosaurs were evolving. Therefore, it is easy to see how *Protoceratops* is the direct ancestor for the next stage, *Monoclonius*.

Monoclonius (mon-o-KLON-e-us), like all the later examples of the Ceratopsid family, evolved on the North American continent during the Upper Cretacious period. There are a number of fossil species extant, including *Monoclonius nasicornus* (top, Figure 2), *Monoclonius crassus*, the first example found, and *Brachyceratops montanensis*, which, though sometimes thought to be of a directly ancestral genera, is more often held to be a juvenile form of still another *Monoclonius* species. All of these were found in formations in Montana except for *Monoclonius nasicornus* which came from the Oldman Formation in the Red Deer River in Alberta, Canada.

Monoclonius first appeared about ninety million years ago. It reached a length of approximately six meters and had a large horn on its nose and incipient brow horns over the eyes. The frill featured a strongly crenulated margin of dermal bones on its edges, though not as developed as a similar structure in the later *Triceratops*.

Triceratops (try-SER-a-tops), pictured at the bottom of Figure 2, was the largest of the ceratopsians and the end of the direct line from *Protoceratops* through *Monoclonius*. It evolved about seventy-five million years ago and lived to the end of the Cretaceous, which ended about sixty-three million years ago. It was so hardy that it was one of the last dinosaurs to survive. It reached a length of nine meters and had three fully developed horns on its head. The brow horns were sometimes nearly a meter long. The margin of the frill featured a row of dermal bones, somewhat limpet-shaped.

Triceratops horridus and *Triceratops prorsus* are two well-established species. Fossils have been found in the Lance Formation of Wyoming, in Colorado and Montana, and in the Canadian provinces of Alberta and Saskatchewan.

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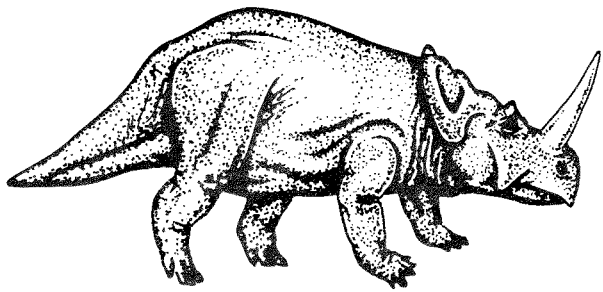
4. Monoclonius



5. Protoceratops (to scale)

1M

6. Triceratops

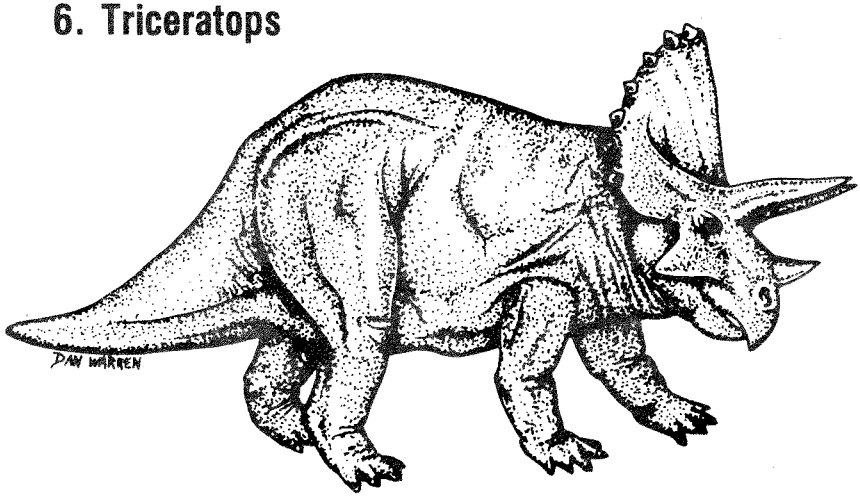


Figure 2

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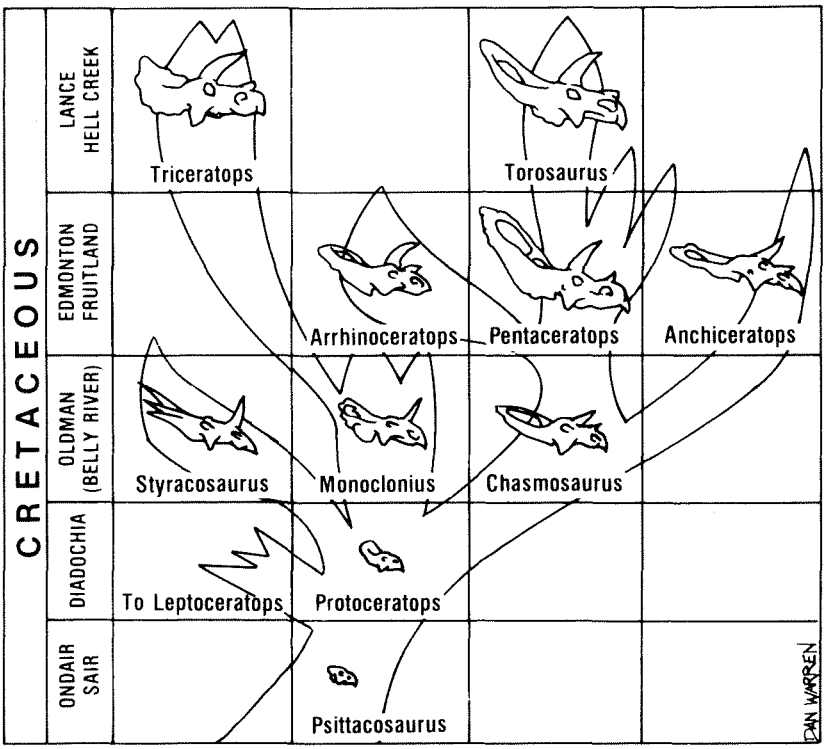

The evolution of the Ceratopsians
(skulls approx. to scale)

The ceratopsian "family tree" shows a number of separate lines of development. Besides the sequence just outlined, there is another major sequence going from *Protoceratops* to *Chasmosaurus* to *Pentaceratops* and ending with *Torosaurus.* This is the long-crested line, shown on the right side of Figure 3. The short-crested line, ending with *Triceratops*, is on the left side. There were many offshoots in the evolution of these dinosaurs too involved to be shown in the diagram.

Two of particular interest that are not shown are *Bagaceratops* and *Montanoceratops. Bagaceratops* was a strange mixture of advanced and primitive characteristics among the Protoceratopsids. For example, although it had a clearly formed horn core above its nose, its frill was only slightly developed. It probably filled a different ecological niche from its larger relative, *Protoceratops*. Its existence demonstrates the variety of transitional forms possible.

Montanoceratops is another example of a transition. It is so transitional, in fact, that paleontologists cannot always agree on where to place it. Some say that it is an advanced Protoceratopsid while others declare it to be a very primitive

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member of the family Ceratopsidae. The dilemma is caused by the fact that, although it still had claws rather than hooves and was only three meters long, a nasal horn was developed, it had longer forelegs, and it had the more robust body proportions of the later and larger ceratopsians. As its name imples, this dinosaur was found in Montana.

These sorts of classification problems are exactly what would be predicted in the light of evolution, but they don't make sense if creationism is true. Difficulty in classification means a lack of distinct separateness between forms. It means one form sometimes almost bleeds into another. Creationism, however, requires very clear distinctions and wide, unbreachable gaps. In the case of the ceratopsians, the evidence overwhelmingly favors evolution.

It should now be clear that the facts from the fossil record utterly destroy Dr. Gish's claim that *Triceratops* appears abruptly in the fossil record without a trace of any ancestors. It was certainly clear to me when I presented a small portion of this data to him in debate on February 2, 1982, at the University of Guelph in Ontario, Canada. But his response was interesting. He declared that, since all the fossils from *Protoceratops* through *Triceratops* were found in the Upper (or Late) Cretaceous strata, they couldn't be an evolutionary sequence. To be an evolutionary sequence, he claimed, these exampes would have to stretch back to the Jurassic or Late Triassic.

First of all, Dr. Gish ignores the fact that *Psittacosaurus* fossils were found in the Lower (or Early) Cretaceous. And second, he ignores the fact that the evolution just from *Protoceratops* to *Triceratops* spanned a period of over twenty-five million years. (Add *Psittacosaurus* and it expands to nearly forty-five million years). That is plenty of time for evolution to take place. Furthermore, it is important to note that the fossils all appear in the correct order; that is, you don't find *Triceratops* below *Protoceratops*, you don't find *Protoceratops* up above *Monoclonius*. The fossils appear in proper sequence and show developmental change. They progressively grow in size, number of horns, size of frill, and strength of jaws. Also certain features remain constant throughout the sequence—for example, the parrotlike beak and the hind legs always being somewhat longer than the forelegs. There are many other features that could be catalogued in this way, too, and have been in the standard scientific literature.

Dr. Gish gave no further response in that debate. However, he was once more confronted with this data in a debate on March 21, 1982, in Tampa, Florida. In this debate with Dr. Kenneth Miller, Gish replied:

> Now let me reply to, well, let's have the next slide, please, quickly. There's a *Triceratops*. There he is. And supposedly he came from a *Protoceratops*. That *Protoceratops* had no horns. He had a horny sheath, something like that. And supposedly it evolved into this creature, with that heavy armor and so forth. No intermediates are found.

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Although he was right that *Protoceratops* had no horns, he was wrong that there are no intermediates. He had already been shown *Monoclonius*, complete with its large nasal horn and two incipient horns over the eyes—which are located in the same place as the large horns in *Triceratops*. It was necessary to repeat this point and to note that the evidence for *Monoclonius* involves, in at least one case, a complete skeleton—it has not been the product of reconstruction.

Dr. Gish gave no answer and seems to have none, and this puts him at the horns of a dilemma. There are only three ways he can go if he wishes to preserve creationism. He can accept the evolution of the ceratopsians but deny that any *other* evolution took place. He can claim that all these dinosaurs were separately created (which is why they all look so different from each other). Or he can claim that they are all the same basic created "kind" (which is why they all look so much alike).

The first choice isn't acceptable because it admits to evolution and leaves the door open for me to go after another of his dinosaur slides in my next article (such as *Stegosaurus*, which also had ancestors he claims did not exist). The second choice will not do because it implies a creator who experiments with first this and then that until he comes up with something he likes. Furthermore, Noah has to load all these experiments onto the ark. The third choice is his best escape and the one that creationist Luther Sunderland chose when I presented him with the same dilemma in a CBC radio debate, taped on May 7, 1982, in Toronto, Canada.

On that program, Sunderland argued that growth in size of body and horns is not uncommon in animals and thus the development of the various ceratopsians is perfectly consistent with the notion of variation only within the originally created "kinds." After the taping, we discussed the evolution of the horse. With this series, too, Sunderland argued that the changes in size and number of rib bones could be accounted for as mere variation within a basic kind. He argued that the present breeding of midget horses shows that horses can be bred small, and he indicated that it might therefore be possible to recreate the stages found in the horse series of the fossil record (excluding *Eophippus*, which he held to be a different "kind" entirely).

This line of argument is further developed in *Biology: A Search for Order in Complexity* by John N. Moore and Harold S. Slusher (pp. 418-420). There it is claimed that fossil horses could simply be small breeds, horses that didn't get proper nutrition, or even sterile hybrids that left no ancestors. The problem with this whole manner of discounting the evidence is that it ignores the large number of individual specimens, their patterned geographical spread showing migration and evolution together, and their appearance in the proper order in the geologic column. Creationists, in order to use this argument, have to believe that all the stages of horse evolution are actually exceptional cases of modern horses in an abnormal condition. Not one fossilized example can be anything other than this.

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Such is the length to which creationists must go in order to answer the clear fossil finds of not only horses but ceratopsians and most other evolutionary series.

Moore and Slusher also accept Darwin's finches as examples of simple variation (pp. 463–466). However, since finches represent transitional changes at the species level and the ceratopsians represent changes at the genera and family levels, when creationists accept both, they define "created kind" in such a broad manner that they can accommodate a great amount of evolution in the name of creation. In their eyes, then, changes anywhere within a family can be dubbed "micro-evolution" and made part of the creation model.

But Niles Eldredge has discovered that creationists will accept even more evolution than this in some fossil sequences. In *The Monkey Business*, Eldredge notes that the thousands of species of fossil trilobites which have been classified into a number of families, superfamilies, and orders are passed off by creationists with the argument that they are all just trilobites and so it doesn't matter (p. 118). Eldredge writes:

> But, apparently to creationists, if you've seen one trilobite you've seen them all, and all changes paleontologists have documented in this important group of fossils are just "variation within a basic kind." . . . Airily dismissing 350 million years of trilobite evolution as "variation within a basic kind" is actually admitting that evolution, *substantial evolution*, has occurred.

This brings us back to Dr. Gish and the ceratopsians. In his book, *Evolution: The Fossils Say No!*, he has this to say about "kinds":

> Among the vertebrates, the fishes, amphibians, reptiles, birds, and mammals are obviously different basic kinds.
>
> Among the reptiles the turtles, crocodiles, dinosaurs, pterosaurs (flying reptiles), and ichthyosaurs (aquatic reptiles) would be placed in different kinds. Each one of these major groups of reptiles could be further subdivided into the basic kinds within each. (p. 34)

The way he uses the term *kind* here, one would think that there are different levels or "kinds of kinds." For example, reptiles are a kind, and within that kind is the dinosaur kind, and, I would assume, within that is the ceratopsian kind. Now where is the common ancestry and where is creation? Clearly, Dr. Gish has a loose enough definition of *kind* that, if people keep throwing the ceratopsians at him in debate, he can eventualy fall back on the argument that they are all the same kind.

It is no problem for evolution if creationists do this. It is rather a problem for creation. It means that creationists are retreating in the face of overwhelming evidence. It means that they are admitting to more and more evolution. It means that they are gradually giving their case away.

This is why I am sometimes surprised when Dr. Gish bases so much of his

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debate arguments on the fossil record. This record isn't as helpful to him as he may have thought it was. We recently have seen more and more creationists admitting that they *do* see evidence for transitional forms, that they *do* find intermediate types, and that fossil sequences without major gaps *do* exist. The transitional forms that creationists have tried to tell us "are nowhere to be found" are actually quite plentiful. This is why creationists have modified their model. Instead of having a creation model that predicts gaps, they now have one that predicts transitional forms and complete lineages.

It seems that creationists have a very flexible position.

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Six "Flood" Arguments Creationists Can't Answer

Robert J. Schadewald

Some years ago, NASA released the first deep-space photographs of the beautiful cloud-swirled blue-green agate we call earth. A reporter showed one of them to the late Samuel Shenton, then president of International Flat Earth Research Society. Shenton studied it for a moment and said, "It's easy to see how a photograph like that could fool the untrained eye."

Well-trained eyes (and minds) are characteristic of pseudoscientists. Shenton rejected the spherical earth as conflicting with a literal interpreation of the Bible, and he trained his eyes and his mind to reject evidence that contradicted his view. Scientific creationists must similarly train their minds to reject the overwhelming evidence from geology, biology, physics, and astronomy which contradicts their interpretation of the Bible. In a public forum, the best way to demonstrate that creationism is pseudoscience is to show just how well-trained creationist minds are.

Pseudoscience differs from science in several fundamental ways but most notably in its attitude toward hypothesis testing. In science, hypotheses are ideas proposed to explain the facts, and they're not considered much good unless they can survive rigorous tests. In pseudoscience, hypotheses are erected as defenses against the facts. Pseudoscientists frequently offer hypotheses flatly contradicted by well-known facts which can be ignored only by well-trained minds. Therefore, to demonstrate that creationists are pseudoscientists, one need only carry some creationist hypotheses about Noah's flood to their logical conclusions. The following six arguments will do just that, giving a sampling of the major difficulties in creationist "flood geology."

Fossils and Animals

Scientific creationists interpret the fossils found in the earth's rocks as the remains of animals that perished in the Noachian Deluge. Ironically, they often cite

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Bob Schadewald is a free-lance science writer, specializing in the off-beat. He has spent seven years doing research on the history of the flat-earth movement and four years researching creationism.

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the sheer number of fossils in "fossil graveyards" as evidence for the Flood. In particular, creationists seem enamored by the Karroo Formation in Africa, which is estimated to contain the remains of 800 billion vertebrate animals (see Whitcomb and Morris, p. 160; Gish, p. 61). As pseudoscientists, creationists dare not test this major hypothesis that all of the fossilized animals died in the Flood.

Robert E. Sloan, a paleontologist at the University of Minnesota, has studied the Karroo Formation. He asserts that the animals fossilized there range from the size of a small lizard to the size of a cow, with the average animal perhaps the size of a fox. A minute's work with a calculator shows that, if the 800 billion animals in the Karroo Formation could be resurrected, there would be twenty-one of them for every acre of land on earth. Suppose we assume (conservatively, I think) that the Karroo Formation contains 1 percent of the vertebrate fossils on earth. Then when the Flood began, there must have been at least 2,100 living animals per acre, ranging from tiny shrews to immense dinosaurs. To a noncreationist mind, that seems a bit crowded.

I sprang this argument on Duane Gish during a joint appearance on WHO radio in Des Moines, Iowa, on October 21, 1980. Dr. Gish did the only thing he could: he stonewalled by challenging my figures, in essence calling me a liar. I didn't have a calculator with me, but I duplicated the calculation with pencil and paper and hit him with it again. His reply was that creationists can't answer everything. He further stated that it has been estimated that there are 100 billion billion herring in the sea and asked how *I* account for that. I tried this number on a calculator and discovered that it amounts to about 27,000 herring *per square foot* of ocean surface. I concluded (*a*) that all of the herring are red and (*b*) that they were created *ex nihilo* by Duane Gish on the evening of October 21, 1980.

Marine Fossils

The continents are, on an average, covered with sedimentary rock to a depth of about one mile. Some of the rock (chalk, for instance) is essentially 100 percent fossils and many limestones also contain high percentages of marine fossils. On the other hand, some rock is barren. Suppose that, on an average, marine fossils comprise 0.1 percent of the volume of the rock. If all of the fossilized animals could be resurrected, they would cover the entire planet to a depth of at least 1.5 feet. What did they eat?

Creationists can't appeal to the tropical paradise they imagine existed below the pre-Flood canopy, because the laws of thermodynamics prohibit the earth from supporting that much animal biomass. The first law says that energy can't be created, so the animals would have to get their energy from the sun. The second law limits the efficiency with which solar energy can be converted into food. The amount of solar energy available is not nearly sufficient.

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Varves

The famous Green River Formation (including shale and limestone) covers tens of thousands of square miles. In at least one place, it contains about twenty million varves, each varve consisting of a thin layer of fine light sediment and an even thinner layer of finer dark sediment. According to the conventional geologic interpretation, the layers are sediments laid down in a complex of ancient freshwater lakes. The coarser light sediments were laid down during the summer, when streams poured run-off water into the lake. The fine dark sediments were laid down in the winter when there was less run-off. (This process can be observed in modern freshwater lakes.) If this interpretation is correct, the varves of the Green River Formation must have formed over a period of about twenty million years.

Creationists insist that the earth is no more than 10,000 years old and that the geologic strata were laid down by the Flood. Whitcomb and Morris therefore attempt to attribute the Green River varves to "a complex of shallow turbidity currents . . ." (p. 427). Turbidity currents—flows of mud-laden water—generally occur in the ocean, resulting from underwater landslides. If the Green River shales were laid down during the Flood, there must have been forty million turbidity currents, alternately light and dark, over about three hundred days. A simple calculation (which creationists have avoided for twenty years) shows that the layers must have formed at the rate of about three layers every two seconds. A sequence of forty million turbidity currents covering tens of thousands of square miles every two-thirds of a second seems a bit unlikely.

Henry Morris apparently has no answer to this. Biologist Kenneth Miller of Brown University dropped this bombshell on Morris during a debate in Tampa, Florida, on September 19, 1981, and Morris didn't attempt a reply. Fred Edwords used essentially the same argument against Duane Gish in a debate on February 2, 1982, at the University of Guelph, Ontario. In rebuttal, Gish claimed that some of the fossilized fishes project through several layers of sediment and that therefore the layers can't be semiannual.

As usual, Gish's argument ignores the main issue, which is the alleged formation of millions of distinct layers of sediment in less than a year. Furthermore, Gish's argument is false, according to American Museum of Natural History paleontologist R. Lance Grande, an authority on the Green River Formation. Grande says that, while bones or fins of an individual fish may cut several layers, in general each fish is blanketed by a single layer of sediment. The few exceptions are explainable when one observes lakes where varves are forming *today*. It sometimes happens that a dead fish is too large to be covered by one semiannual sedimentation, and so its bones or fins end up protruding through newer layers that are later observed to form. When an object or animal is too large, this *must* happen, and therefore such a protrusion cannot be used as evidence against a great age for the Green River Formation.

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Disease Germs

Humankind is the only known "reservoir" for numerous communicable diseases. That is, the germs or viruses which cause these diseases can survive only in living human bodies or well-equipped laboratories. Well-known examples include measles, pneumococcal pneumonia, leprosy, typhus, typhoid fever, small pox, poliomyelitis, syphilis, and gonorrhea. The scientific creationists insist on a *completed* creation, in which the creator worked but six days and has been resting ever since. Thus, between them, Adam and Eve had to have been created with every disease and had to have passed them all to their children. Later, somebody must have carried them onto Noah's ark.

Note that the argument covers *every* disease germ or virus which can survive only in a specific host. But even if the ark was a floating pesthouse, few of these diseases could have survived. In most cases, only two animals of each "kind" are supposed to have been on the ark. Suppose the male of such a pair came down with such a disease shortly after the ark embarked. He recovered but passed the disease to his mate. She recovered, too, but had no other animal to pass the disease to, for the male was now immune. Every disease for which this cycle lasts less than a year should therefore have become extinct. Furthermore, *fatal* diseases would have caused both the host animals and the diseases to disappear.

Creationists cannot pin the blame for germs on Satan. If they do, the immediate question is: How do we know Satan didn't create the rest of the universe? That has frequently been proposed, and, if Satan can create one thing, he can create another. If a creationist tries to claim that germs are mutations of otherwise benign organisms (degenerate forms, of course), then he or she is arguing for evolution. Such hypothetical mutations could only be considered favorable, since only the mutated forms survived.

Fossil Sequence

At all costs, creationists avoid discussing how fossils came to be stratified as they are. Out of the thousands of pages that Henry Morris has written on creationism, only a dozen or so are devoted to this critical subject, and he achieves that page count only by recycling three simple apologetics in several books. The mechanisms he offers might be called victim habitat, victim mobility, and hydraulic sorting. In practice, the victim habitat and mobility apologetics are generally combined. Creationists argue that the Flood would first engulf marine animals, then slow lowland creatures such as reptiles, while wily and speedy humans escaped to the hilltops. To a creationist, this adequately explains the order in which fossils occur in the geologic column. A scientist might test the mobility hypothesis by examining how well it explains the fact that flowering plants don't occur in the

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fossil record until early in the Cretaceous era. A scenario with magnolias (a primitive plant) heading for the hills, only to be overwhelmed along with early mammals, is unconvincing. And when marine fossils are found in many places above those of land animals and plants, the victim habitat apologetic loses all credibility, too.

If explanations based on victim habitat and mobility are absurd, the hydraulic sorting apologetic is flatly contradicted by the fossil record. An object's hydrodynamic drag is directly proportional to its cross-sectional area and its drag coefficient. Therefore, when objects with the same density and the same drag coefficient move through a fluid, they are sorted according to size. (Mining engineers utilize this phenomena in some ore separation processes.) This means that all small trilobites should be found higher in the fossil record than large ones. Since this is not what we find, the hydraulic sorting argument is immediately falsified. Indeed, one wonders how Henry Morris could ever have offered it, given his background as a hydraulic engineer.

Overturned Strata

Ever since the geological arguments of George McCready Price became a mainstay of creationism in the 1920s and 1930s, many creationists have tried to point out places in the earth where fossils appear in the opposite order for evolution. They claim that reversals in the order prove that the geologic column is fiction. They then challenge scientists to come up with an explanation.

Actually, scientists have a good explanation for this reversal in the fossil order. They point to obvious signs of folding in the strata, which reveal how the ancient sediments have been flipped over. In such places, it should be expected that the geologic column would read backwards.

When it is not so obvious that this has occurred, there is another way to tell. If rock strata containing trilobites are overturned, the trilobites that are usually found belly down in the rock will now be found belly up. Other things which show geologists and paleontologists which way is up include worm and brachiopod burrows, footprints, fossilized mud cracks, raindrop craters, graded bedding, and similar evidences.

It is really creationists who have no explanation for such strata. Could the flood suddenly reverse the laws of gravity and lay *up* sediments and fossils instead of laying them *down?* Upside-down sediments are clearly a problem for the creation model. This isn't surprising, however, given that right-side-up sediments seem to be a problem for it, too.

Each of the six preceding arguments subjects a well-known creationist hypothesis

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to an elementary and obvious test. In each case, the hypothesis fails miserably. In each case, the failure is obvious to anyone not protected from reality by a special kind of blindness.

Studying science doesn't make one a scientist any more than studying ethics makes one honest. The studies must be applied. Forming and testing hypotheses is the foundation of science, and those who refuse to test their hypotheses cannot be called scientists—no matter what their credentials. Most persons who call themselves creationists have no scientific training and they cannot be expected to know and apply the scientific method. But the professional creationists who flog the public with their doctorates (earned, honorary, or bogus) have no excuse. Because they fail to submit their hypotheses to the most elementary tests, they fully deserve the appellation of pseudoscientist.

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Self-Correction Corner

The editors regret mistakes made in two recent articles in *Creation/Evolution* and acknowledge that the errors were those of the editors and not the original authors.

In Number VI, a typographical error appeared in "Misquoted Scientists Respond." On page forty, paragraph three, Laurie Godfrey wrote, "But neither Jolly nor any anatomist would ever confuse the mouth of a baboon with that of a hominoid such as *Ramapithecus*. . . ." Unfortunately, *hominoid* appeared as *hominid*, and the meaning of the sentence was thereby improperly altered.

In Number VIII, an editorial error appeared in "Kelvin Was Not a Creationist" by Stephen G. Brush. Page eleven, paragraph four, line five read: "While the accuracy of some of these scientific developments may be disputed . . . " when it *should* have read, "While the accuracy of some of these attributions may be disputed. . . ." Brush did not desire to question the accurcy of Lord Kelvin's scientific developments but rather the accuracy of attributing all those developments exclusively to him. —*F.E.*

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As the World Turns: Can Creationists Keep Time?

William M. Thwaites and Frank T. Awbrey

Creationists constantly remind us that their conclusions are based on scientific evidence. But often when we examine those conclusions, we find cases of jumping to conclusions without checking the facts. One such case of a recent creation-science *faux pas* comes from the Midwest Center of the Institute for Creation Research, specifically the Center's director, Walter T. Brown, Ph.D. Here is what Dr. Brown writes in a pamphlet entitled *Evidence that Implies a Young Earth and Solar System:*

> Atomic clocks, which have for the last twenty-two years measured the earth's spin rate to the nearest billionth of a second, have consistently found that the earth is slowing down at a rate of almost one second a year. If the earth were billions of years old, its initial spin rate would have been fantastically rapid—so rapid that major distortions in the shape of the earth would have occurred.

This sounds like a pretty compelling argument, and it has already been quoted by other creationists in support of their claim that the earth is very young (Chui). If one takes Brown's deceleration rate of one second loss per year each year and extrapolates 4.6 billion years into the past, one can calculate that there would have been about 53,500 days per year at that time. Each day would have been only ten minutes long.

Since satellites just above the atmosphere take about one hour to orbit the earth, it stands to reason that objects traveling six times this velocity at the equator would fly off into space. In other words, Brown is correct in asserting that, had the earth been slowing at the rate he suggests and were it as old as radioisotope decay indicates, there woud have been "major distortions" of the earth's shape at the time of formation. The earth would have been shaped something like a very large rapidly spinning pizza crust. But Brown doesn't believe that this was ever the case, so he solves the apparent dilemma by assuming that the earth was formed much more recently than the widely accepted value.

Before we all join Brown as young-earthers, however, we should realize that

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Brown's deceleration value of one second per year per year is much greater than the accepted value of 0.005 second per year per year. Brown is off by 20,000 percent for two-hundred-fold! If one extrapolates back in time 4.6 billion years with the accepted estimate of 0.005 second per year per year, one gets a fourteen-hour day. This means that objects at the equator would have been traveling at rates considerably less than the escape velocity. The effect of such a spin rate can be seen with the planet Jupiter. It spins on its axis in ten hours and is only slightly oblate—hardly anything like the flattened earth to which Brown alludes. Hence, the earth's observed spin deceleration rate does not falsify the notion that the earth is 4.6 billion years old.

That should settle the matter. Brown used an erroneous datum to reach a faulty conclusion. But it is interesting to try to find out how the error was originally made. Did Brown make the mistake himself or did he find this error ready-made in the literature?

To answer this question, we sought the three references that Brown used. Unfortunately, one reference is an Air Force document ("Earth Motions and Their Effect on Air Force Systems," Air Force Cambridge Laboratory, November 1975, p. 6), which we were not able to locate. Perhaps the U.S. Air Force misled Brown and all the blame should be heaped onto them. However, that's not likely. In dozens of cases where we have checked references for the sources of other creationist errors, we have found that the error was not in the original paper.

Be that as it may, we were able to find the *Popular Science* (Fisher) and the *Reader's Digest* (Finchger) references. Neither of these said anything about the deceleration rate being one second per year per year. In fact, the *Popular Science* article even showed a graph from which one can calculate the standard 0.005 second per year per year figure. Even in the unlikely event that the error originated in the Air Force pamphlet, Brown is still accountable for failing to check out the discrepancy. If two out of three of his references either give the correct value or say nothing about the second per year per year value, then why did Brown list these references along with the Air Force pamphlet? And why didn't he list an astronomy book or a book on time keeping?

Of course, many might answer these questions by saying that creationists are deliberately exploiting a gullible public. In this case, though, we think that Brown has a better excuse. The effect of the earth's slowing spin rate on time keeping is actually quite perplexing. We are so accustomed to thinking of the length of a day and night period as being constant that it is difficult for most of us to think of time at all without equating it to the turning of the earth on its axis. So it is easy to imagine how Brown was misled when he first read about this subject.

In order to understand what is really going on, we need to be reminded of a couple of things about the principal motions of the earth. Remember, while the length of time it takes the earth to go around the sun is quite constant, the rota-

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tion of the earth on its axis is quite a different matter, due mainly to tidal friction. It takes a lot of energy to move all that ocean water around twice a day, and the price of all this work is the earth's ever-slowing spin rate.

The slowing isn't noticeable to someone camping on a seashore, at least not to one camping without an extremely accurate time piece. But if one were to measure a day very accurately, wait a year, and then measure another day, the second day would, on the average, turn out to be about 0.000014 seconds longer than the first.

This is no big deal to the typical camper, but to a technological society that is seemingly addicted to a 86,400-second day it presents a real dilemma. We used to take care of this discrepancy by the simple expedient of making the seconds a little longer, so that 86,400 of them would just fill up a day.

But purists wanted a standard invariable second, so, about twenty years ago, an "atomic second" compromise was agreed upon. Since then, an atomic clock counts standard seconds while the earth just keeps slowing, so that each year it takes about 0.005 standard seconds more to complete 365.25 rotations. The slow-down rate is given just this way: 0.005 seconds per year each year. This is written: 0.005 sec./year/year. Thus we are really comparing two clocks—standard or atomic clock that does not slow down and a somewhat less-than-perfect clock that keeps slowing. Now let's get back to Brown's error.

Both the *Reader's Digest* and the *Popular Science* articles make much of what are called "leap seconds." To help understand the leap second, we would like to lead you through some simple calculations that you can do—and Brown should have done—with pencil and paper or calculator. We are going to add up the differences between a perfect clock and one that slows down a little each year. We will use the formula:

$$D_{previous} + (N \times 0.005) = D_{new}$$

D: stands for the difference between the perfect clock and the earth (a clock that is gradually slowing down)

N: is the number of years that the perfect clock and the earth have been allowed to drift apart

0.005 is the measured slowing rate for the earth

Actually, the earth's deceleration rate is not a constant 0.005 sec./year/year, but that need not concern us yet. Also, we must assume that our clock keeps perfect time. (Atomic clocks come very very close to satisfying this assumption.) Now we synchronize the clock and the earth and start keeping time. At the end of the first year, we find that the earth has slowed down and is 0.005 second behind the perfect clock. There is no need yet to let the perfect clock tick off an extra "leap" second to allow the earth to catch up with the clock. The earth would now start the second year 0.005 second behind the atomic clock. It would slow down

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another 0.005 second and at the end of the second year would be running at a rate that was $2 \times (0.005) = 0.01$ sec./year slower than the clock. By summing the first year's deficit and the loss incurred during the second year, we would get $0.005 + 0.010 = 0.015$ second; still no need to have a leap second. The deficits at the ends of the succeeding years would be 0.03, 0.05, 0.075, 0.105, and so forth. The earth would find itself 1.05 seconds behind the clock after twenty years, and it would then be spinning at a rate that was 0.1 second per year slower than the atomic clock. (See, we told you it was confusing.)

Keep up with those calculations. By throwing in a leap second now, the earth could almost catch up to the atomic clock. The deficit would be reduced to 0.05 second by having the leap second, but the error would be accumulating at an even faster rate. In fact, the error would accumulate to another second in just 8 more years, in the 28th year of the standard. You would need another leap second at 35, 40, 45, 49, 53, and 57 years. The leap seconds would get increasingly common as the earth continued to spin more and more slowly. The first two leap seconds to occur just one year apart would occur in years 110 and 111 after the system had been instituted. The last skipped year when no leap second would be needed would be the year 186 of this system. By the year 214, some years would need double leap seconds.

Now remember, all of these calculations are based on an absolutely uniform slowing rate of 0.005 sec./year/year. Having a leap-second-year every year means that the earth's spin rate is 1 sec./year slower than the atomic clock, not that the earth is slowing 1 sec./year/year. Evidently Brown read that we were needing leap seconds almost every year and erroneously concluded that our spin rate was slowing 1 sec./year/year. That's what can happen if you "know" the answer before you start the problem.

Still, you might be wondering why we have had so many leap seconds already when we have only had the atomic clock system for a couple of decades. "Shouldn't we be getting ready for our first leap second," you ask, and "Shouldn't the next one be eight years down the road?" There are two reasons for such a high frequency of leap-second years in just the short time since the atomic clock standard was instituted. First, the standard was not based on the first year of its inception but rather on the earth's nineteenth-century rotation rate. Second, the earth's slowing rate is not uniform. In *Greenwich Time and the Discovery of the Longitude*, Derek Howse provides a graph that shows this fluctuation for the past two centuries. Time could be measured very accurately before atomic clocks, but it took laborious astronomical observations and tedious calculations to do so. The atomic clock has made accurate time keeping an everyday moment-to-moment convenience. Atomic clocks also have managed to fool young-earth advocates into thinking that they had physical evidence to support their religious convictions.

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A Note About Calculations

Please don't accept on faith our calculations of the earth's primordial spin rate. Below is a simplified example of the type of calculations we did. Be a skeptic. Check it out for yourself.

Assume (for the sake of simplicity, not realism) Brown's slowing rate of 1 sec./year/year. Note also that there are about 31.6 million seconds per year.

Imagine a time 31.6 million years in the future. By this time, according to Brown, we would have added 31.6 million seconds to the year. More likely, we would add 24 leap hours to every day. That would give us 24 standard atomic clock hours plus 24 leap hours every day. It is easy to see that the day would be 48 hours long. In other words, the earth's spin rate would be one half of our current rate.

Likewise, 31.6 million years ago, the earth would have been spinning at twice the rate it is now. The day would have been 12 of our hours long. Using Brown's figure to go 4.6 billion years into the future, we find that the earth would be spinning at about 1/143 of its present rate, so 4.6 billion year ago it should have been spinning 143 times as fast. This gives us about a 10-minute day and a pizza-shaped earth. Too bad Brown's number is way off. It was a great young-earth argument. In fact, it sounds so good that we'll bet that creationist go right on using it anyway.

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Old-Time Religion and the New Physics

Robert M. Price

For many who had not previously been interested in the fundamentalist movement, the current creation-evolution conflict has served as an introduction to the polemical tactics of the extreme right wing of born-again Christianity. And such late-in-the-day acquaintance with fundamentalist apologetics is rather unfortunate, since in the long "history of the warfare of science with theology" chronicled by Andrew D. White, some of the most interesting campaigns have been waged by the fundamentalists. The wise strategist better equips himself for the struggle by familiarizing himself with other battles his enemy has fought. The present article will attempt to meet this need by drawing attention to another current attempt by fundamentalists to bend scientific research to their own purposes. In the process, the general outlines of their "scientific" propaganda program will become clear, as will the role in the whole picture of the creationist offensive. Creationism's twin is the endeavor to vindicate fundamentalist supernaturalism by appealing to the new physics.

A Sliding Scale

For fundamentalist apologists to appeal to modern physics to substantiate their faith implies that they *accept* modern physics. This may seem odd to outsiders who have followed the debate over evolution. Why does the biblical literalist reject modern biology but embrace modern physics, when the former would seem to be as well-founded evidentially and methodologically as the latter? H. Richard Niebuhr supplies our answer:

> As a churchman the question about the value of science becomes for him the question about its value in relation to the church. . . . How are scientific beliefs related to the creed? . . . If science is out of harmony with the creed it may still be regarded as an errant child that will eventually mend its ways. When its theories can be used for the support of the creed and the church, it may be valued not as sinner but as saint. (*Radical Monotheism and Western Culture*, p. 83)

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Writing before the current creation-evolution debate, Niebuhr nevertheless described with deadly accuracy the dubious stance of fundamentalists vis-a-vis science. The criterion for a given hypothesis's acceptability is not its inherent cogency but rather its positive or negative value for the evangelistic arsenal. The biblicist is already convinced of the truth of his inherited faith, so the truest scientific theory must be the one which comports best with it. And physics seems to fit, whereas evolution does not.

Yet an even more interesting explanation of the seemingly inconsistent attitude of fundamentalist apologists toward science lies in what might be called "the sliding scale of biblical inerrancy." On issue after issue, biblicists have maintained the literal "scientific" truth of biblical statements on cosmology, chronology, and so forth, until the massive preponderance of evidence (and, one suspects, public opinion) made it impossible any longer to dismiss the results of scientific research. Then, with a sudden about-face, apologists claim that the Bible has not been shown to be in error, but that science has merely corrected our exegesis of what the literal sense of the Bible was trying to tell us all along! Charles Hodge, one of the framers of the modern doctrine of biblical inerrancy wrote:

> If geologists finally proved that it [the earth] has existed for myriads of ages, it will be found that the first chapter of Genesis is in full accord with the facts and that the last results of science are embodied on the first page of the Bible. (*Systematic Theology*, Vol. I, p. 171.)

The clear implication is that the Bible, like an obedient ventriloquist dummy, would be made to parrot *any* inevitably conclusive scientific results. In other words, the apologists begin affirming that the Bible, not upstart science, tells us about the world. But, maintaining the pretense, they finish up tacitly by admitting that science *not* the literal sense of the Bible tells us about the world. Exegesis must await scientific results, which, nonetheless, it will never acknowledge. What we have here is a kind of hermeneutical ventriloquism.

Even more ironic than this "if you can't beat 'em, join 'em, but pretend you beat 'em" attitude, is the chutzpah that even dares to read scientific results into the text and then use this alleged "anticipation of modern science" as a proof for the divine inspiration of the Bible! Among countless examples of this effrontery, one might consult the chapter, "Modern Science in an Ancient Book," in Harry Rimmer's *The Harmony of Science and Scripture.* For instance, apologists have claimed that wireless telegraphy is predicted in Job 38:35, "Canst thou send lightnings, that they may go, and say unto thee, Here we are?" Jesus is imagined to have implied the sphericity of the earth in his reference to the end of the world: "On that night two people will be one bed; one will be taken and the other left. Two women will be grinding grain together; one will be taken and the other left" (Luke 17:34-35). This is supposed to mean that it will be night and day simultaneously, that is, on different sides of the globe. Yet, obviously, they are merely two

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illustrations of what *may* happen, since "no one knows the day nor the hour" (Mark 13:32). One of the most recent and most humorous instances of this sort of thing is the claim of Tim LaHaye of the Moral Majority that Proverbs 5:18–19 anticipated the results of Masters and Johnson's research on the importance of sexual "foreplay"! (*The Act of Marriage*, p. 17).

To those familiar with other aspects of fundamentalist propaganda, all this may seem oddly reminiscent of the claims of Hal Lindsey and other dispensationalist seers who, hearing the latest news on Iran or Israel, run to the book of, say, Habakkuk to dredge up quickie "prophetic predictions" of the events. One must ask, if the Bible had predicted it all along, why did we hear of it from Walter Cronkite before Hal Lindsey? But an even more striking parallel is to the claim of Erich von Daniken, Josef Blumrich, and others that "God drives a flying saucer." These eccentrics scour the Bible (as well as other ancient materials) for "anticipations of modern science" such as iron pillars that never rust, crystal skulls, hieroglyphic spacesuits, and, of course, Moses' radio-receiver (Von Daniken, *Chariots of the Gods?*, p. 40) and Ezekiel's space vehicles (Blumrich, *The Spaceships of Ezekiel*; Von Daniken, *Chariots of the Gods?*, pp. 35–39). Only the UFO cultists see something that the fundamentalists do not: that real evidence of advanced science in ancient sources would be evidence *not* for divine inspiration but for surprisingly advanced technology, whether possessed by ancient cultures in their own right or by visitors from the starship *Enterprise*.

So much for the efforts to co-opt modern science. We must ask why fundamentalists are not content similarly to accept the theory of evolution and then to make opportunistic use of it. Instead they fight this battle on debating platforms and in legislative halls. The reason for this discrepancy is that fundamentalists *do* wish to defend the plain literal reading of the text and will give it up only as a last resort. Those fighting under the banner of "scientific creationism" do not yet realize that the battle for the "six days" and the fixity of species has been lost. As a result, they are free to see the conflict between Darwin and Genesis literally read, whereas the long-lostness of other battles actually prevents them from even seeing the disparity between Copernicus or Columbus and the literal sense of the Bible. They would react defensively if anyone pointed out that Genesis 1 literally describes a flat earth floating on an ocean below a solid dome. Those who can see which way the present battle is going have suddenly "realized" that Genesis *really* meant to teach "punctuated" or "progressive" creationism. Though species are still fixed, either the six days were very long ones or there were ages *between* each day, sort of a milder version of the Gap Theory of C. I. Scofield and R. B. Thieme, whereby dinosaurs are consigned to a preliminary creation read in between Genesis 1:1 and 1:2 and destroyed at the time of Satan's revolt (Thieme, *Creation, Chaos, and Restoration; New Scofield Reference Bible*, p. 1, 752–753).

It is important to indicate at this juncture that the wild implausibilities we

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have considered here are *not* entailed by the espousal of "theistic evolution" by evangelical Christians such as members of the American Scientific Affiliation. Many of these people have distanced themselves from strict fundamentalism (what Bernard Ramm calls "hyper-orthodoxy"). They believe in biblical authority in theology, but are at liberty to recognize in the biblical text the presence of various genres of ancient literature. They are not compelled by a wooden biblicism to read Genesis 1 as a blow-by-blow description of the origin of the earth. So far as they are concerned, the "how" of God's creation is a question to be settled by scientific research, not by exegesis. The evidence in favor of evolution leads them to conclude that evolution was the "secondary cause" employed by God.

Of course, there is still the problem that evolution's process of chance mutation and environmental selection is inherently nonteleological, whereas "theistic" evolution implies just such teleology. Yet this is no new problem. There are still various nonreligious proponents of "vitalism," "finalism," or teleological evolution (see George Gaylord Simpson, *The Meaning of Evolution*, pp. 107–113). Besides, the apparently random process of evolution might be seen by evangelicals as simply one more aspect of the "theodicy" problem recognized by all honest Christians (for example, Alvin Plantinga, *God, Freedom, and Evil*)—that is, how are the apparent chaos and carnage in the world reconcilable with the "teleology" of God's loving providence? It should be clear that evangelical evolutionists are not guilty, either of any inherent contradiction in their position or of the intellectual dishonesty of the fundamentalist "scientific creationists."

Subatomic Apologetics

Having outlined the rationale whereby some aspects of modern science are opportunistically affirmed while others are stubbornly denied, we will, as promised, move on to detail some of the ironies implicit in the latest attempt to co-opt modern science, in this case subatomic physics, for fundamentalist apologetics. This appeal has taken three principal forms.

First, certain apologists have tried to identify the strong nuclear force binding protons together in the nucleus by reference to Colossians 1:17. In one of his earlier cartoon pamphlets, polemicist Jack Chick writes:

> The protons have positive charges. One law of electricity is that *like charges repel each other!* Being that all of the protons in the nucleus are positively charged, they should repel each other and scatter into space. *What holds them together?* . . . It says that Christ the Creator "was before all things, and *by him all things are held together*" Colossians 1:17. (*Big Daddy?* n.p.).

It might seem unfair to cite a cartoon by Jack Chick in order to represent funda-

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mentalist opinion, but the same line of thought also occurs in D. Lee Chesnut's *The Atom Speaks*, published by none other than the Creation-Science Research Center in San Diego (1973). After a statement of the problem similar to Chick's, Chesnut concludes:

> And so the Scriptures themselves, here in Colossians 1:17, recognize and tell us that the Son of God is administering the law or laws required to hold all things together, a condition that we now find accentuated by discovery of the colossal binding force now known to be within the nucleus of the atom. (p. 38)

Chesnut sees the evidence of a divine planner in what seems to him the incomprehensible complexity of nuclear physics:

> We have seen the laws underlying nuclear science defy all attempts at rationalization; they can be interpreted only as evidence of a great predetermination that this was the way all things were to be made. (p. 144)

We have already discussed sufficiently the hoax, displayed again here, that modern science is miraculously intimated in the Bible. But there is an even more striking feature of this particular example. The argument of Chick and Chesnut reveals not only a woefully poor grasp of science but also a surprisingly lame theology. Several years ago, martyred theologian Dietrich Bonhoeffer had warned of the dangers of such a *Deus ex Machina* concept of God as one more link in the chain of this-worldly cause-and-effect. He remarked on:

> . . . how wrong it is to use God as a stop-gap for the incompleteness of our knowledge. For the frontiers of knowledge are inevitably being pushed back further and further, which means that you only think of God as a stop-gap. He also is being pushed back further and further and is in more or less continuous retreat. (*Letters and Papers from Prison*, p. 190)

In such a schema, God sooner or later finds himself losing his job to automation, as Robert F. Streetman has imaginatively put it. Of course, by and large, most theologians of whatever stripe now repudiate this "god-of-the-gaps" position. Anyone familiar with theological discussion is amazed to find such a view still alive and well in "scientific creationist" literature.

A second use to which contemporary subatomic physics is put by fundamentalist apologists concerns the vindication of the doctrine of the Trinity. In this regard, Chesnut finds helpful the analogy between God as "three persons, yet one essence" on the one hand and "the three basic particles of matter: an electron, a neutron, and a proton. . . . With respect to their electrical condition, they exhibit a family relationship, yet each is different. . . . These three entities are, nevertheless, actually different forms of the same substance—energy. Further-

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more, brought together in the right relationship, these three particles, while still retaining their individual identities, form a new identity, an atom of a chemical element" (p. 119).

John Warwick Montgomery takes a slightly different approach:

> A close analogy to the theologian's procedure here lies in the work of the theoretical physicist: Subatomic entities are found, on examination, to possess wave properties (*W*), particle properties (*P*), and quantum properties (*h*). Though these characteristics are in many respects incompatible (particles don't diffract, while waves do, etc.), physicists "explain" or "model" an electron as *PWh*. They have to do this in order to give proper weight to all the relevant data. Likewise, the theologian who speaks of God as "Three in One." (*Spectrum of Protestant Beliefs*, pp. 20–21)

Finally, Werner Schaafs echoes the belief that "The Trinity 'God, Jesus, Holy Spirit' appears to be reflected in the triad 'energy, corpuscle, wave' " (*Theology, Physics, and Miracles*, p. 82).

The trouble with such analogies (which incidentally seem reminiscent of the efforts of medieval Catholic apologists to demonstrate the Trinity from various instances of "three-ness" in nature) is that they tend logically to argue for views which, from the apologists' own viewpoints, must seem heretical! For instance, Chesnut's analogies seem to vacillate between "modalism" (the doctrine that Father, Son, and Spirit are merely three "forms" or "modes" in which the divinity is externally expressed, rather than being three distinct personal centers) and a denial of the full divinity of any of the three persons (since only together do Father, Son, and Spirit constitute the implied "new identity" of "God"). Likewise, Montgomery would seem to be arguing (though not intentionally) for a form of "economic trinitarianism"—that is, God only appears to be three, but is inherently either unitarian or unknowable. Real trinitarianism, by contrast, affirms that "We worship one God in Trinity and Trinity in Unity, neither confounding the Persons nor dividing the Substance" (Athanasian Creed).

Third and final, we come to the most remarkable irony of all, the attempt to vindicate supernaturalism by appealing to the indeterminacy principle of Heisenberg. Schaaffs suggests that:

> The new causality principle, manifested most clearly in the uncertainty relation, endows the statistical picture of physics . . . with significance far surpassing the bounds of physics and is helpful to theology. As we indicated, it is possible through statistics to interpret rare events, deemed miraculous, as being fully consistent with natural law. . . . Physics cannot rule out, and must in fact accept, the possibility that a good force (God) or an evil force (the Devil) intervenes to provoke an atomic reaction without in any sense doing violence to natural law. (*Theology, Physics, and Miracles*, pp. 65–66)

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John Warwick Montgomery takes similar delight in what he takes to be the death-knell of deterministic cause-and-effect:

> For us, unlike people of the Newtonian epoch, the universe is no longer a tight, safe, predictable playing field in which we know all the rules. Since Einstein, no modern has had the right to rule out the possibility of events because of prior knowledge of "natural law." . . . No historian has a right to [believe in] a closed system of natural causation, for as the Cornell logician Max Black has shown . . . the very concept of cause is "a peculiar, unsystematic, and erratic notion," and, therefore, "any attempt to state a 'universal law of causation' must prove futile." (*Where Is History Going?*, p. 71)

So, the apologists contend, no one need feel ashamed to recognize the occurrence of paranormal and extraordinary events, as if they implied some superstitious belief in magic, for now "miracles" can be rendered plausible since anything is as possible as anything else! The fundamentalists Schaaffs and Montgomery have sold their birthright for a mess of naturalistic pottage. Biblical "miracles" are rendered "believable" or "probable" precisely by being rendered *nonmiraculous*! By discarding the notion of calculable causality, they have suggested in effect that odd events may "pop up" randomly, on their own. The apologist needs the very system of causation he has discarded in order to show that apparently *un*caused events are actually *divinely* caused, that natural causes alone cannot account for, for example, the empty tomb of Christ. Instead, to make sense of the evidence of Easter morning, one must posit divine intervention, divine causation—God raised Jesus from the dead. Basically then, any argument from miracles assumes the validity of causality but argues that some important causes (divine ones), being ignored by naturalists, are necessary for an adequate explanation of reality. Actually, this latter is *precisely* the way in which Montgomery and company argue for the resurrection elsewhere (for example, *History & Christianity*, pp. 72–78). They just do not see that the argument from physics against causality subverts such arguments completely. In fact, if one were to approach the issue of Jesus' resurrection on the grounds provided by the appeal to the new physics, one would end up arguing that it is quite probable (at least plausible) that Jesus came back to life, but that this must have been a freak accident, proving absolutely nothing about Jesus' divine mission or his relation to God. The strategy, then, is that of getting the unbeliever to accept the narrative at face value at any cost, even if the whole point of the gospel writers (God's miraculous intervention) is rendered superfluous.

And, ironically, exactly the same logic was the genesis of the "swoon theory" of the resurrection advocated by naturalistic rationalists like Paulus and Venturini. Unlike the fundamentalist, these men *intentionally* rejected explanations involving the intervention of divine causation, yet were concerned to "save the appearances" in the resurrection narratives. Yes, Jesus *was* crucified and

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buried, and he *did* appear after three days to his disciples—yet miracles are out of the question, so he must have merely swooned on the cross, revived in the tomb's cool air, and staggered back into Jerusalem to meet his followers—back from the tomb, but not back from the dead. Fundamentalists universally reject the "swoon theory," yet the argument from physics against causality would logically tend to result in the same kind of reasoning. Schaaffs and Montgomery show that their real concern is with the inerrant accuracy of the biblical text, not with the beliefs and values taught therein. (The interested reader may find very helpful the discussions of the fundamentalist tendency unwittingly to evacuate the text of the miraculous in order to "defend" its accuracy found in chapter three of Van Harvey's *The Historian and the Believer* and chapter eight of James Barr's *Fundamentalism*.)

A Self-Fulfilling Prophecy

In closing, we may ask what can possibly motivate the kind of blatant axe-grinding and special pleading we have observed here as well as in the creationist assault on evolution. Fundamentalists say they love the truth, yet they seem to be guilty of the worst kind of intellectual dishonesty. The trouble arises from the fact that fundamentalists see the truth as something already possessed (a "faith delivered once-and-for-all to the saints" [Jude 3]), rather than something to be pursued.

Apologist Francis Schaeffer issues this challenge to his followers:

> *The truth of Christianity is that it is true to what is there.* You can go to the end and you need never be afraid, like the ancients, that you will fall off the end and the dragons will eat you up. You can carry out your intellectual discussion to the end of the game, because Christianity is not only true to the dogma, it is not only true to what God has said in the Bible, but it is also true to what is there, and you will never fall off the end of the world! (*He Is There and He Is Not Silent*, p. 17)

With this striking metaphor, Schaeffer means to assure his readers *in advance* that all the evidence will be found to agree with the evangelical biblicist view of things. The fundamentalist can count on never having to change his mind. What wonder that this assurance becomes a self-fulfilling prophecy as the biblicist runs up against evidence that does not easily comport with his view. It will be made to do so, or to seem to do so. Either it will be denied in the name of the biblical text (cf. the creationist attack on evolution) or it will be ventriloquistically co-opted (as in the case of the new physics). Not only is such a doctrinaire stance out of the question for scientists, but it is also surely alien to the sentiments of the Apostle Paul who was humble and honest enough to admit that "now we see through a glass darkly . . . now I know in part" (I Corinthians 13:12).

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Letters to the Editor

Dinosaurs and Dragons

Eden Films (formerly Films for Christ) has been advertising a recent release, *The Great Dinosaur Mystery*, billed as taking up where *Footprints in Stone*, their earlier release, left off. As the fine articles in your Issue VI (Fall 1981, pp. 16–29), by Godfrey and Weber, clearly show, *Footprints* is incredibly ludicrous in its claims. Amazingly, *The Great Dinosaur Mystery* is even more so!

It tries to show that historical and mythological references to dragons (the Apocrypha, St. George, and so forth) and some ancient paintings demonstrate that dinosaurs must have lived in historical times alongside human beings. On this basis it infers that evolution must be wrong and the entire geological timetable as well. However, the film is a blatant repeat of the shoddy reasoning of von Daniken's many publications, though, of course, done for different motives. Using the argument of the film, one would have to conclude that unicorns, leprechauns, and griffins have also existed (not to mention witches, demons, and trolls). And, even if coexistence should scientifically be established in the future, changing the paleontological timescale would not be justified, as the recent discovery of the supposedly extinct coelacanth demonstrates.

Weber has justifiably called the Paluxy River "footprints" the creationists' "Piltdown." I would call *The Great Dinosaur Mystery* the creationists' "ancient astronaut."

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Waxahachie, TX

Clayton vs. Chastain

It seems to me that John N. Clayton was not entirely candid in his reply to Dr. Garvin Chastain (*Creation/Evolution* VII). Clayton claims that the lectures he gave at Boise State University were not on the evolution-creation controversy and that he is not a member of the creationist movement. These claims may be true, for all I know. But Clayton also spoke at the University of Saskatchewan in Saskatoon. The substance of his remarks and the contents of his handouts indicate that he agrees in large measure with the "scientific" creationists.

Clayton gives a lecture entitled "God, Man, and Caveman." Part of the description reads: "An examination of man as uniquely created in the image of God is presented. The physical anthropological explanation of the origin of man and founding evidence is considered to show that the biblical account is more consistent with the evidence." More consistent

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than evolutionary theory, I presume. Lesson IX in a course on "Christian Evidences" for children, provided by Clayton, is entitled "How Do We Know the Theory of Evolution Is Wrong?" Lesson X is called "How Do We Know We Didn't Come from an Apelike Ancestor?" and Lesson XI is "How Do We Know Genesis Is Right?"

It seems to me that Clayton is a member of the creationist movement —if not officially, then in spirit. Perhaps the chief difference between Clayton and the "scientific" creationists is that Clayton does not insist on a creation within the past ten millenia.

Clayton claims that ". . . if there is a conflict between science and religion, we either have bad science or bad religion. . . ." Clayton apparrently wishes to resolve that conflict by having science conform to the doctrines of bad religion.

B. E. Zamulinski
Saskatoon, Saskatchewan

I found John N. Clayton's letter, in which he denies being a member of the creationist movement, very puzzling. His traveling "Does God Exist?" roadshow came to Tucson not long ago, and during the question-and-answer period he spent at least twenty minutes trying to convince me that Genesis was in perfect agreement with the scientific evidence for the development of life on earth. And he had the color slides to prove it!

In case you haven't caught his act, his particular approach is to "work both sides of the street," so to speak. For example, he delights in proclaiming that he believes in evolution; but, when pressed, he denies that plants and animals evolved from other plants and animals. Contradictory? You bet. Mr. Clayton states in *Creation/Evolution* that he is "not a member of the creationist movement." In his publication, *Does God Exist?* however, he says:

> We need to oppose attempts of theistic evolution to compromise the integrity of the biblical record. *The objectives of our creationist friends are noble and right* but there are some very great weaknesses in their approach and some areas where much damage is being done because of incorrect use of terms and the attempt to promote denominational positions that are not biblical. (February 1982, 9:2:4, emphasis added)

In other words, his creationist friends haven't been biblical *enough* to suit his tastes!

When writing to the "faithful," his anti-evolutionary crusade is obvious:

> We could literally fill this publication every month with examples of design characteristics in nature that could not possibly occur by chance. Design demands a designer and, when one looks at the creation, the wisdom and diversification of that Designer become all the more obvious. (*Does God Exist*, February 1981, 8:2:11)

> There are very few, if any [inter-

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mediate forms], so it is obvious that to claim that evolution is a fact is to demonstrate a rather poor understanding of the nature of science (*Does God Exist?* July 1981, 8:7:3)

Many scientific techniques have been used to preserve and understand the history of the Bible. Scientific discoveries have repeatedly shown the accuracy of the biblical record. If the same God who created all things inspired the writing of the Bible, there is no possibility of a fact being discovered that would not support the biblical record. (Ibid., p. 5)

All races of man came from Adam and Eve—indicating indirectly that great change in man can occur. (Ibid., p. 8)

The fact of the matter is that the erectness of the forms such as *Australopithecus afarensis* is not only unconvincing but is not a good indicator that the form is man. Even if the form were erect, there is no way it could be called man or even something close to man. Their jaws were typical ape jaws and their brain size was around 400 cubic centimeters—no bigger than the brain of a modern chimpanzee. . . . Even the name tells you that this is no human (*Australo*—south; *pithecus*—Greek word for ape). . . . (*Does God Exist?* June 1981, 8:6:6)

Because every human on earth was killed by the flood except those who were a part of Noah's house, every human on earth today is a descendant of Noah. This is proven by several facts—scientifically and biblically. . . . All cultures carry in their religion or folklore the remnants of what happened in the flood which clearly proves that all cultures have a common thread connecting to Noah. (*Does God Exist?* July 1980, 7:7:6-7)

. . . Nearly all alleged links to man are actually racial variations of apes (variations within a given species). *[Australopithecus afarensis]* is simply another of those cases which is being glorified by the mass media in an attempt to support the theory of evolution. (*Does God Exist?* October 1980, 7:10:15)

"The heavens declare the glory of God and the firmament showeth His handiwork," the Psalmist says. We can know there is a God "through the things he has made" (Romans 1:19-21). Look at the world and show the world to your child by comparing the idea that life and its complexities have been created by an intelligent God with the foolish notion that it could happen by a bunch of "beneficial accidents." (*Does God Exist?* December 1981, 8:12:4)

By his own words, Mr. Clayton is certainly a "creationist," by any definition in common use. This is his right, of course. I just wish he would own up to it.

His letter in *Creation/Evolution* was correct in one point, however; he is certainly *not* a biology teacher, as the following incredible quotation from him makes clear:

It is common in classroom presentations on evolution to claim that the Duckbill Platypus is a missing link between the birds [!] and the reptiles. . . . Because the evolutionists have tried to relate the Platypus to reptile-bird evolution, the mammalian characteristics of

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the Platypus have been largely ignored. [!] (*Does God Exist?* April 1981, 8:4:3–4)

John Samuel Massa
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Complex Issue

Creation/Evolution is doing an important and necessary job by documenting evidence of the absurdity of so-called "scientific creationism." But it does seem as if some of its contributors have fallen into the trap of greatly oversimplifying a highly complex subject. As Garvin Chastain rightly said ("Letters," *Creation/Evolution*, V), "Creationists oversimplify and, in doing so, distort the evidence." This makes it all the more important for their opponents to avoid making the same mistake.

Admittedly, they have been led into this by the excesses of certain creationists. Michael Ruse has pointed out in his report (*New Scientist*, February 1982) of the notorious court hearing at Little Rock that the state law being contested had defined "creation science" as accepting, among other things, "a relatively recent inception of the earth and living kinds."

It is but a short step from this to concluding that creationists all believe in a recently created earth. In fact, the most aggressive creationist organizations want people to believe this: that they frequently assert that all "genuine" creationists are at one with them on this matter. But this is not the case. Creationists of this genre are certainly the best organized, the most aggressive, and the most vociferous; but they are not the only ones, and, in Europe at least, are probably not the most numerous.

It is therefore disconcerting to find in a journal concerned with fact and truth the sweeping generalization, "Creationists claim that the universe is at most ten thousand years old" (Schadewald, no. IV). Several other contributors also imply this, without stating it explicitly. Freske, in volume II, is exceptional in noting that "Most, though not all, creationist organizations are committed to the belief that the universe was created no more than ten thousand years ago." Edwords, in number III, rightly indicates that there are several different sorts of creationists, but unfortunately he refers to recent-creationists as believers in "special creation"—a term which has been used for more than a century in Christian literature as a synonym for creation. Moreover, he subsequently lapses into the prevailing custom of referring to recent-creationists as simply "creationists."

It may help to set the matter in perspective if I explain that as recently as twenty years ago recent-creationists formed only a small minority of creationists in England and were rarely taken seriously. In recent years they have grown somewhat in numbers and influence in England, although to nothing like the same extent as they appear to have done in America. There are still a great many

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educated British creationists who accept without question the cosmological and geological evidence that the universe is billions of years old and that life is hundreds of millions of years old. These ancient-creationists generally regard their recent-creationist brethren as an embarrassment, as part of the eccentric fringe of Christianity.

It would avoid a great deal of unnecessary misunderstanding if writers attacking such absurdities as flood geology and the concept of a young earth would always use the term *recent-creationists* in order to make quite clear that it is only this one particular species that is referred to.

Another example of oversimplification is the implication that all those who oppose Darwinism are Christian fundamentalists. Most of them are, but by no means all. It is important to recognize that there is a very small, but by no means negligible, body of opposition to Darwinism on purely scientific grounds. And I am not referring here to biologists such as Gould, who would like to make substantial amendments to Darwinian theory, but to those who would like to see it swept aside and replaced by an entirely new theory of the mechanism of evolution. (One of the unfortunate consequences of oversimplification is that the public in general, and many professional biologists, seem to be unaware that informed opposition to Darwinism actually exists.)

The best contemporary example is Pierre Grasse. One of Europe's most distinguished zoologists, he concurs with a number of leading French biologists in regarding neo-Darwinism as an Anglo-Saxon aberration. A convinced evolutionist, he has devoted many years and hundreds of thousands of published words to arguing the inadequacy of Darwinism and the need to replace it by a more convincing explanation of how evolution could have occurred. Other equally eminent biologists who took a similar stand a generation earlier were the entomologist, W. R. Thompson, and botanist J. C. Willis.

Finally, there are a number of agnostic scientists of some distinction—generally physicists, mathematicians, or statisticians—who have looked at evolutionary theory in the light of their own discipline and concluded that what Jaques Monod called "chance and necessity" could not adequately explain the complexity of life. Instead, they have argued that there must be some kind of vital directive principle built into the nature of matter thus giving it a self-creative property or else, like Hoyle and Wickramasinghe believe, that there must be one or more supernatural creative powers abroad in the universe.

To sum up, it is a pity to portray the situation as if there were only two competing philosophies: on the one hand, Darwinism; on the other hand, the fundamental version of creationism. In fact, there is a whole spectrum of views, with five major divisions: Darwinists, anti-Darwinian

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evolutionists, nonreligious quasi-creationists, religious ancient-creationists, and religious recent-creationists.

By keeping these distinctions clearly in mind, and by using appropriate terminology, writers will be better able to oppose error and assist the pursuit of truth.

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Leamington Spa
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All of Dr. Hayward's points are well-taken; however, something more needs to be said. The term special creation, *which I continue to use, has come to mean (in North America at least), the combined notions of sudden and recent creation. The suddenness element involves creation of all life from nothing within a short space of time (say, in six days). The recentness idea means an earth and universe that are only six- to fifteen-thousand years old. When I take the trouble to say* special creation, *it is because I intend to distinguish it from other creation notions mentioned in the same article, such as the day-age theory, the gap theory, and so forth.*

The rest of the time I do "lapse" into abbreviating the whole concept by simply saying creation *or* creationism. *I hope, however, that from the context everyone knows what is meant. If not, let me state now that the policy of* Creation/Evolution *is to focus on answering the arguments of those creationists who are politically active in North America (and often abroad). Since the politically active creationists usually believe in a sudden and recent creation (coupled with belief in a worldwide flood, a miraculous origin for languages, and a few other related notions), those are the beliefs to which we respond. We are a specialized publication. It would be cumbersome to always specify the belief system every time we wished to say "creationist." That would be akin to saying "member of the U.S. Democratic Party" every time we wanted to say "Democrat," so as not to cause confusion regarding various sorts of social democrats in other countries.*

Nonetheless, Dr. Hayward has properly cautioned us not to imagine that this particular brand of creationists represents all the others. He has reminded us that we are not compelled to think of creation only on their terms. And he has given us a broader perspective on the variety of views that exists in this area.

As for any implying that all those who oppose Darwinism are Christian fundamentalists, I hope we have not done that. This is certainly not our intent. However, we will seek to be more cautious in the future.

Frederick Edwords
Editor

Transcendental Meditation

I would like to comment on the article by Dr. Robert Price which appeared in *Creation/Evolution* VII. I have a Ph.D. in botany, recently attended a conference on evolution and public education at the University of

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Minnesota, and have practiced TM for over seven years. Accordingly, I feel reasonably well informed on the subjects of evolution, scientific creationism, and the Science of Creative Intelligence (SCI).

Dr. Price attempts to draw many parallels between scientific creationism and SCI, but the two are actually very different, as we shall see.

First, the charge that TM or SCI is a religion. For most people, a religion is a discipline of thought that requires (1) a belief in a god, (2) attendance of some sort of worship service on a regular basis, and (3) the abidance of certain moral rules of conduct in going about one's life. Neither the study of SCI nor the practice of TM has any of these requirements. One could practice TM and study SCI and be an atheist, be free to conduct one's life however one sees fit, and attend any worship service one chooses or none at all. Superficial resemblances of TM or SCI to a religion (and Mr. Price conjurs up a number of them) are exactly that—superficial. Because TM (SCI) lacks the above-mentioned requirements, it is not and never was a religion. It was, in fact, originally conceived as a means of developing one's spiritual awareness without religion by means of a simple technique to release stress. Any reference to the TM movement's certificate of incorporation to the term *religious* with regard to the practice of TM was meant in a spiritual sense completely different from what we normally think of in the context of a religion. It is for this reason, and not to mislead, that the Spiritual Regeneration Movement was renamed the TM Movement.

In sharp contrast to the practice of TM or the study of SCI, belief in scientific creationism requires both belief in God and acceptance of a literal interpretation of creation as presented in the Christian Bible. This qualifies scientific creationism as basically religious in the sense that most people think of when the term is used.

With regard to whether or not SCI is really a science, again, a definition is a good starting point. Most any dictionary defines science basically as systematized knowledge derived from observation, study, and experimentation carried on in order to determine the nature or principles of what is being studied, by means which are repeatable by independent observers. The most reliable indication of whether a discipline of thought and investigation meets these criteria is the appearance of studies regarding it in respected scientific journals, as is the case with SCI. Literally scores of studies of TM, conducted at many universities and research institutions, have been published by such widely respected journals as *Science, Scientific American, American Journal of Physiology, Journal of Psychology*, and so forth. Although Dr. Price does not claim to have read any of these publications (none are cited), he severely criticizes and attempts to discredit them. Any such attempts should take into account the fact that articles appearing

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in most scientific journals have withstood critical evaluation not only by the editor but also by widely respected experts in the field with which the article deals. Dr. Price goes on to say, quoting a critic, that some researchers have been unable to replicate certain findings of the TM research, yet he cites no studies showing such results. To my knowledge, there are no published studies indicating results significantly at odds with the effects of TM shown so often by researchers.

Again in sharp contrast to the TM movement, scientific creationism cannot claim even one study supportive of their views which has been accepted for publication by a respected scientific journal. It therefore, is not basically scientific in nature.

Finally, let us briefly consider the teaching of TM in public schools. Unlike the way scientific creationists have pushed their teachings, the TM movement did not seek to make SCI a required part of any high school course or curriculum, only to make it available for those who were interested. As for the court case, the ruling was a preliminary one. The TM movement could have appealed but decided to wait until the public had a better understanding of TM and SCI before pursuing the matter further.

It is clear, then, from the standpoints of religion, science, and education, that SCI and scientific creationism are not at all alike, and it is important that your readers be made aware of this fact.

David G. Fisher
Rhinelander, WI

Many of Dr. Fisher's points are well taken. However, I must note that the main purpose of my article was to show that TM (the Science of Creative Intelligence) is as religious as scientific creationism. For example, it seems to me that meditators have never adequately explained away the prima facie religiosity of the initiatory puja *(worship) ceremony which all prospective meditators must undergo. And all this talk about "cosmic consciousness," "God consciousness," and "Brahma consciousness"—is this secular?*

Even if we leave all this aside (and I see no good reason for doing so), there is the evidence of Dr. Fisher's own remarks. He refers to the "spiritual awareness" that is the goal of TM. This, too, sounds pretty religious. True, TM necessitates no belief in God, but neither do Buddhism nor Jainism. Most religions (though not literally all *of them) do entail regular worship meetings and moral commandments, and TM does not. But this is not exactly the point. TM is* not *"a religion." The real issue is, is it religious? Prayer is not "a religion" either, but it certainly is an aspect of religion. The doctrine of theistic creation is not "a religion," but it sure is religious, and that's why we shy away from having it taught in public school biology classes.*

Dr. Fisher points out that TM never sought what the creationists seek—namely, that their technique be required *in schools. True, but this is not the relevant point. Simple sanctioning of religious teaching in public*

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schools would be quite as constitutionally problematical as requiring it. On a related matter, all I sought to show was that creationism must be considered religious in the same technical, legal sense that TM was considered in the court decision, and this is admittedly a pretty nebulous sense.

As to whether TM is actually a science, let me remind Dr. Fisher that I did not rule out the possibility that "some tests might indicate at least that the relaxation technique of TM produces concrete results." This is, in fact, all that one can scientifically verify about the effects of TM. Could any scientific study conceivably verify the claim that meditators practicing TM make contact with the "field of creative intelligence"? If there are any such studies published in reputable scientific journals, I would certainly like to see them.

After noting this in my article, I gave admittedly secondary sources for critiques against TM's verifiable claims. My primary purpose was to show that studies conducted by TM people or which were subjective in nature were open to suspicion. But I was clear that results should not be dismissed out of hand for this. Thus, I did not "severely criticize" TM's claims.

I should like to warn Dr. Fisher, however, that "the appearance of studies regarding it in respected journals" does not constitute proof of TM's claims. "Respected journals" are filled with studies that are later challenged and discredited. That is the nature of the self-checking process of science. Studies are published so as to be subjected to peer review, not to be declared true. Publication is not proof. This is a fact often forgotten by creationists who frequently quote outdated and disputed journal articles in support of their case. So let us not be too hasty with appeals to authority.

Overall, I appreciate the fact that Dr. Fisher and I agree that "scientific creationism" is a dangerous sham. We merely disagree on the tangential question of whether TM is to be considered religious in an academic (though important) sense.

Robert M. Price
Bloomfield, NJ

Corner on Plants

I rise to the defense of Dr. Gish, who has been most unfairly and falsely criticized by Kenneth Miller in *Creation/Evolution* VII. I find Professor Miller's article rather heavily weighted with the same kind of special pleading with which he accuses Dr. Gish. But on page nine, he really goes overboard.

Dr. Miller quotes a sentence that Dr. Gish quotes from E. J. H. Corner's article, "Evolution," in *Contemporary Botanical Thought*, Anna M. MacLeod and L. S. Cobley, editors (Edinburgh and London: Oliver and Boyd, 1961): "Much evidence can be adduced in favor of evolution, but I still think that to the unprejudiced the fossil record of plants is in favor of creation." Then he gives

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what he alleges is the correct quote from Corner: ". . . the fossil record of *higher* plants is in favor of *special* creation" (emphasis added by Miller), thus indicating that Dr. Gish had misquoted by deleting the word *higher.* Dr. Miller then goes on to explain to us what Dr. Corner really meant to say—namely, that he was only talking about the major form of higher plant, the angiosperm or flowering plants. I am pleased to report to you that Dr. Gish in this case is right and Dr. Miller is wrong.

The book from which the contested quotation comes is rare, but three or four years ago I tracked it down in a major university library. The word *higher* is not in Dr. Corner's sentence. Furthermore, his article is dealing not with the origin of higher plants but with the origin of plants—that is, the several catagories of plant taxonomy. In the closing sentences of the same paragraph, he says, "Can you imagine how an orchid, a duckweed, and a palm have come from the same ancestry, and have we any evidence for this assumption? The evolutionist must be prepared with an answer, but I think that most would break down before an inquisition."

Corner continues in the following paragraph: "Textbooks hoodwink. A series of more and more complicated plants is introduced—the alga, the fungus, the bryophyte, and so on, and examples are added eclectically in support of one or another theory—and that is held to be a presentation of evolution. . . ." Thus it is quite clear that Dr. Gish quoted correctly and that he properly understood Corner, who had in view the fossil record not merely of the higher plants, the angiosperms as Miller alleges, but of all the taxa of the Kingdom Plantae.

I wonder where Dr. Miller found that word, *higher?* Evidently creationists are not the only people who on occasion goof by accepting uncritically something they find in secondary or tertiary sources. But we knew that all the time, didn't we?

Robert E. Kofahl
Science Coordinator
Creation-Science Research Center

Robert E. Kofahl is quite correct in pointing out my misquote of E. J. H. Corner, which appeared in Creation/Evolution *VII. Let me explain how it happened.*

The Corner quote is a favorite of Gish, because it seems to show a noted botanical authority admitting that the evidence is on the side of creationism. Dr. Gish has used it nearly every time he writes or speaks, and I, like others opposing creationism, have become accustomed to dealing with it. The Corner text reads:

> *The theory of evolution is not merely the theory of the origin of species but the only explanation of the fact that organisms can be classified into this [taxonomic] hierarchy of natural affinity. Much evidence can be adduced in favor of the theory of evolution—from biology, bio-geography, and paleontology; but I still think that, to the unprejudiced, the fossil record*

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of plants is in favor of special creation.

How does one deal with that? In the simplest way possible: by explaining what characteristics of the plant fossil record led Corner to that statement and by seeing whether those characteristics best fit the creationist schemes of Dr. Gish and Dr. Kofahl or whether they best fit evolution.

Corner used his reference about "special creation" to dramatize the lack of a continuous fossil record of the evolution of plants. There are discontinuties (gaps) in the plant record, and they are spectacular. As an example, I generally choose what most experts will agree is the most dramatic and most striking gap: the appearance of the higher plants (Angiosperms) about 135 million years ago. Taking the sudden appearance of these organisms, which now dominate the planet, as a perfect example of Corner's concern, we can then see if Gish's creation model is supported.

I used exactly this tack in an article which appeared in American Biology Teacher *earlier this year. In that article, I showed how the basic tenets of special creation require all living things to have been formed during a single creative period (one week?) which took place anywhere from six thousand to ten thousand years ago. I then pointed out that none of Dr. Gish's writings makes this aspect of "scientific" creationism clear.*

I next asked, "Why is this aspect of scientific creationism missing from their critiques on evolution and the fossil record?" This is an important question, because the answer is that Gish's own characterization of the fossil record contradicts the doctrine of a single creation!

I used the sudden appearance 150 million years ago of the angiosperms to make my point, noting that, since Gish is quite right about the gap that preceeds this appearance, he must be wrong that everything was created only once and at the same time as everything else. For if the latter were true, there should be no new forms appearing at various places *in the fossil record, no matter how suddenly. All forms now existing or that have ever existed should have had their origins in the* lowest *and* oldest *fossil layers, and all forms we see today should exist* throughout *the record. Since this is not true, the fossil record clearly negates the possibility of a single creation event.*

In this article, which was published before the Creation/Evolution *article, I quoted Corner correctly. And in the light of the basic argument I used there, which was the same one that I made in the* Creation/Evolution *article, I have no interest in misquoting Corner. But because I am used to discussing the higher plants as the most spectacular example about which Corner is talking, I carelessly inserted the word* higher *into the quote when I typed the manuscript and then faulted Gish for not using it. That was a careless error, and the readers of this journal have my apologies for that.*

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Nevertheless, the charge of misquote against Gish is more serious. Why? Because Dr. Gish did more than insert a single word, he deleted all of the references that Corner made in support of evolution and *the word* special *which qualifies the meaning of* creation. *Gish's version of the Corner quote reads (with Gish's deletions bracketed):*

> *Much evidence can be adduced in favor of [the theory of] evolution [from biology, bio-geography, and paleontology]; but I still think that, to the unprejudiced, the fossil record of plants is in favor of [special] creation.*

Well, we all make mistakes, and I can't excuse my error by noting his. But Gish's misquotation is not a mere mistake, typographical error, or failure of memory; it is a misuse of Corner's intent.

By working from the false premise that Corner's version of creation was supportive of the ICR or CSRC doctrine of a single *creation event, he made a misrepresentation of the first rank. As I pointed out in my* American Biology Teacher *article, the* very problems *in the fossil record to which Corner was alluding disprove without qualification Gish's and Kofahl's theories. Creationist authors do not like to address the problem posed by the sequential character of the fossil record, but intellectual honesty demands that they should.*

Finally, I'd like to thank Dr. Kofahl for bringing my error to my attention, and I am glad to have had the opportunity to correct it. Because Dr. Kofahl is so interested in making sure that Corner and other scientists are quoted correctly, I await an explanation of how Dr. Gish happened to leave out special *and eight other words from his reading during the debate with Doolittle and also why Dr. Kofahl did not correct that matter in his letter pointing out my error. I'll keep watching my mail.*

Kenneth R. Miller
Associate Professor of Biology
Brown University
Providence, RI

Paluxy Footprints

I rise again on the same day to defend Dr. Kelly Segraves, our director, from the unfair and erroneous attack upon him by Robert M. Price in *Creation/Evolution* VII, referring to an article in *Creaton/Evolution* VI by Henry P. Zuidema.

According to Price, Zuidema charged that the human tracks reported by Segraves in his book, *The Great Dinosaur Mistake*, were recently admitted by local residents to be fraudulent carvings in the surface of the Cretaceous limestone rock through which the Paluxy River flows. Price asks Segraves to "revise his propaganda" in the light of this new information. Allow me to set the record straight.

In 1970, shortly after its establishment, the Creation-Science Research Center sponsored, along with Films for Christ Association of Elm-

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wood, Illinois, an expedition to the Paluxy River valley in Texas to examine reported human footprints on Cretaceous limestone surfaces also bearing many dinosaur footprints. Dr. Segraves accompanied this group and personally observed the sandbagging of the river bed and the uncovering there of several sequences of footprints. He also observed the stripping off of several feet of layers of limestone and debris next to the riverbank to uncover fresh footprints never before seen by modern man.

All of this is recorded in the film, *Footprints in Stone*, produced by Films for Christ using the footage taken of the above reported activities. Dr. Segraves took his own photographs of footprints and fitted his own bare foot into some of the prints. Some months later, he returned with another group and personally assisted in stripping off layers several feet think of limestone and debris to uncover another sequence of footprints in the surface of the Cretaceous limestone. He took photographs of these prints. A number of his photographs are included in his little book mentioned above.

There is not the slightest possibility that the footprints reported in *The Great Dinosaur Mistake* by Dr. Segraves were carved. They are either bona fide human footprints or they are the prints of some other creature which lived at the same time that dinosaurs lived on the earth. They give every appearance of being human prints, of variously sized individuals from children to giants. If they were not produced by human feet, what kind of feet were they, planted in the soft mud at the same time that huge dinosaurs were squishing through the same mud?

I think that Price and Zuidema owe Kelly Segraves an apology and a retraction.

Robert E. Kofahl

My thanks to Dr. Kofahl for setting the record straight. In rechecking my research materials I find that I have indeed confused Kelly Segraves's find with other prints in the Paluxy River area which, according to researchers from Loma Linda University and elsewhere, are admitted to have been carvings. This is a serious mistake on my part. I hope Kelly Segraves and Robert Kofahl will accept my apologies and understand that my intent was to speak to the footprint issue generally, merely noting that, as Zuidema put it on page five of Creation/Evolution *VI, "The subject is further fogged by the many reports of the fabrication of humanlike prints by residents of the Glen Rose area. . . ." I did not desire to convey the impression that all footprint finds turned out to be carvings, nor do I now wish to imply that Dr. Kofahl must be correct in assuming the uncarved examples are human.*

Robert H. Price

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News Briefs

On June 25, 1982, the U.S. Supreme Court ruled in the *Island Trees Board of Education* vs. *Pico* case that the First Amendment limits the power of school boards to remove books from school libraries. The five-to-four decision came after a seven-year legal battle by the ACLU to prevent parental pressure groups and local school officials from capriciously banning books merely because those books disagreed with the philosophy of the banners. The case now returns to federal district court for a trial of the factual issues in the case: whether the Island Trees school board was politically motivated in removing works by Kurt Vonnegut, Bernard Malamud, Jonathan Swift, Langston Hughes, and others on the grounds that they were "anti-American, anti-semetic [*sic*], anti-Christian, and just plain filthy." The Supreme Court ruling merely established the guidelines upon which the matters of fact must be tried.

The importance of this case for those combatting creationism is clear. Parents and school boards may not, on political or religious grounds, remove evolution books (whether scientific or philosophical) from public school libraries. This protects these materials from censorship. But one must remember that censorship cannot work the other way either. Creationist books that have found their way into public school libraries will also have to be left alone. It is only in the area of the curriculum that those opposing creationism can act, because it is unconstitutional for creationists to promote religion in the classroom or to entangle the schools in religious matters. Furthermore, it is possible to remove the teaching of any pseudoscience on purely academic grounds without practicing censorship. This is because it is the business of education to teach the "state of the art" in any given discipline, and thus educational institutions are under no obligation to give "equal time" or "balanced treatment" for outdated theories.

In mid-February of this year, U.S. Congressman Fortney H. Stark conducted a survey of the opinions of the voters in his district (East San Francisco Bay area of California, including the cities of Livermore and Oakland). The results of his survey were published in the June 2 edition of the *Congressional Record*. Out of 7,840 respondents to his questionnaire, 62.1 percent answered "No" to the question, "Do you believe that, when teaching evolution, the teaching of the theory of creationism should be required by law?" Only 37.9 percent answered "Yes." Thus, in his district at least, the majority of the voters oppose "balanced treatment" for creationism. Stark, himself, is an opponent of creationist efforts.

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